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BY H. KNAPP.

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ON THE DIAGNOSIS OF ONE-SIDED DEAFNESS.

By H. KNAPP.

IN diagnosticating one-sided deafness, we are accustomed to avail ourselves of the conduction of sound through the cranial bones. If, in one-sided deafness, a watch or, better, a tuning-fork, is placed on the incisor-teeth, or some point in the middle line of the skull, its sound is heard on the side of the healthy ear only. If, under the same conditions, this ear is closed, the sound is heard more loudly, whereas the closure of the other ear has no influence on the perception of sound. The "bone conduction," however, is frequently unreliable or unavailing. Persons of undeveloped powers of observation are unable to tell on which side of the head they hear the sound, and their preconceived ideas commonly place its enforcement by closure on the wrong side. In persons over forty-five years of age the bone conduction, tested with tuning-fork or watch, is frequently wanting, though the hearing be normal. On the other hand, when it exists, there is no means of excluding its influence upon the perception of sound. However carefully, for instance, we close our ears, we are still able to understand loud conversation. The ordinary tests of hearing—watch, voice, musical instruments, tuning-forks, etc.—when employed in the usual manner, suffice to determine hardness of hearing, but are insufficient to ascertain complete deafness of one ear, when the hearing of the other is not greatly impaired. To supplement the well-known tuning-fork test which, as above-mentioned, is not always available, I may recommend two other methods which are applicable, and, I think, yield reliable results in all cases. The one will be understood by the following remarks:

If a vibrating tuning-fork is moved up and down, before a healthy ear, its sound appears enforced as often as the instrument passes the level of the external auditory canal. If we, how-

ever, tightly close the ear before which the fork is moved, the sound appears no longer periodically louder, but uniform, being perceived mainly by the other ear. If the closure of the one ear is not complete, the periodic enforcement is still perceptible, though less marked. If a vibrating tuning-fork is moved up and down before a totally deaf ear, the sound of the tuning-fork invariably appears uniform. The waves of sound, in this case, travel in circuitous roads around the head to the membrana tympani of the healthy ear, never impinging on it in a direct way, which, in the previous experiment, produced the periodic enforcement of sound.

To illustrate the application and usefulness of this method, I may be allowed to report the following observation:

X. X., the daughter of N. R., of Philadelphia, Pa., æt. 13, consulted me on the 7th November, 1874. A year previously her parents had accidentally noticed that she was deaf in her right ear. They took her to a well-known surgeon, under whose care she had been ever since, but the treatment was without any result. She had had scarlet-fever and measles in her childhood, but her ears had never been affected as far as the parents could notice, and she has continued in good health. I found the *left* ear normal in all the parts accessible to physical examination, its acuteness of hearing greater than the average standard, namely, $h = \frac{2}{3}0$, $v = \frac{3}{4}0$, $m = \frac{8}{9}0$, or more. The pharynx was healthy. The external meatus of the *right* ear was narrower than that of the left. It contained normal ear-wax, but, in addition, a moderate quantity of white scales in its inner third. After removing the wax and scales by soaking, syringing, and wiping with cotton-wool, I found the walls of the canal and the membrana tympani fairly healthy, with the exception of some retraction of the anterior part of the drumhead. On inflation by Politzer's method and the Eustachian catheter, the air was heard freely to enter the tympanic cavity, without producing any change in the appearance of the drumhead. The left ear being closed, the tick of a watch of 10' hearing distance was not heard by the right ear through the air, nor on contact with the auricle. But when the watch was firmly pressed against the ear, its tick was faintly perceived. When placed on the temporal or the mastoid region, it was distinctly heard, and louder still when placed on the forehead. The right ear remaining closed, a loud voice was understood at a distance of two feet, and the strains of a small musical box was heard at a distance of six feet from the right ear, that is $v = \frac{2}{3}0$, and

$m = \frac{6}{80}$. The acuteness of hearing remained the same when both ears were closed. When vibrating tuning-forks were moved up and down before the left ear, she heard a corresponding periodic enforcement of the sound like the "puffs of a locomotive," as she very appropriately described it. When tuning-forks were moved up and down before the right ear, she heard them only when the vibrations were strong, and she heard a uniform, "even," sound. Closing the left ear, she heard the loudest sound of the tuning-fork for a few seconds only and "evenly." Tuning-forks, placed on the teeth or the forehead, were heard on the left side only, their sound was louder when the left ear was closed, but remained the same when the right ear was closed or kept open.

These tests furnished very precise results, and the conclusive evidence that all the patient could hear, she did hear with the left ear. I told the parents that, in my opinion, the right ear was totally deaf, and not amenable to treatment.

In the other method of detecting one-sided deafness, the pneumatic otoscope of *Siegle* is made use of. When we apply this instrument to our own ears, the movements of the drumhead are distinctly perceived as a sound at a low pitch. Patients hearing well with one ear, but being deaf in the other, hear the difference readily—the healthy ear receiving a marked sensation of sound, the deaf ear no sensation of sound at all.

The following case illustrates this and the other tests :

On the 11th of November I was consulted by Mrs. M. B., of Montreal, Canada, a healthy-looking lady of twenty-five years of age, who gave the following history of her case : When she was four years old she had scarlet fever, which left no sequels, and did not affect her ears at all. When she was eight years old, one day, while on her way to school, and trying to cross a street crowded with wagons, she was thrown down by a horse and kicked with the hoof on her right temple. She was carried in an unconscious state to the school-house and thence to her home, where she soon recovered her senses, but suffered with nausea for some days. For some weeks she was inclined to dizziness, and, when she lay down, the objects around her seemed to move as if she were on board of an ocean vessel. These symptoms disappeared gradually, and she has been well ever since. Six years ago she discovered accidentally—on being addressed by a woman, standing at her right side—that she was hard of hearing in her right ear. Not being annoyed by it, she consulted no physician.

Status præsens: An angular scar in right temporal region. External ears and drumheads normal and alike on both sides. Pharynx healthy. Both drums readily inflatable. Hearing on left side more than normally acute. Right h , v , and $m = 0$. $h = \frac{1}{\infty}$, when watch in contact with bone; the sound louder, when watch is placed nearer to the other ear. Tuning-fork from teeth and forehead heard in left ear only, enforced when left ear is closed, whereas closure of the right has no effect. A vibrating tuning-fork, moved up and down before the left ear, produces periodic enforcements of sound, "puffs"; but is heard uniformly when moved before the other ear. *Examined with the pneumatic speculum, both drums are movable—the left with a distinct sensation of sound, the right without any.*

I have no doubt that the right ear was completely deaf, and think that the blow from the hoof of the horse on the right temple occasioned a fracture of the walls of the labyrinth. The symptoms mentioned above: unconsciousness, vertigo, apparent motions of objects when she lay down, point to an affection of the labyrinth. Cases of double-sided traumatic deafness, occurring under similar symptoms, are not very rare. Further observation and more accurate examination will, perhaps, furnish also a greater number of cases of one-sided deafness than has been hitherto noticed. If we bear in mind how frequently and heavily children will fall on their heads, we may well be astonished at the rarity of permanent injury they receive. Though their bones be more elastic than those of adults, I sometimes thought that a fracture of the petrous bone, the densest and most brittle bone in the human body, might have been the cause of deaf-mutism of children, in whom no general disease of any kind nor any abnormality in the parts of the auditory organs accessible to physical examination, could account for the absence of hearing-power. Perfect deafness is caused either by a disease in the labyrinth or the brain, and seems to be irremediable. To facilitate its diagnosis when it exists on one side only, and to assist in a correct appreciation of the cases as to prognosis and treatment, the above-mentioned methods of examination will be found useful, and, I think, sufficient. They are, briefly recapitulated, as follows:

Firstly. In one-sided complete deafness, a tuning-fork, vibrating on the incisor teeth or the middle line of the skull, is heard on one side only. Its sound is enforced when the ear of this side

is closed, but remains unchanged when the other ear is closed. This method is well known, but in many cases unavailable.

Secondly. A vibrating tuning-fork moved up and down before a healthy ear, causes an enforcement of sound, like the puffs of a locomotive, as often as it passes the level of the external auditory canal. When moved before a totally deaf ear, its sound is still perceived, *i.e.*, by the other ear, but uniformly, that is, without periodic enforcements.

Thirdly. The pneumatic otoscope in a healthy ear makes the movements of the membrana tympani audible as a deep, but distinct sound, whereas, in a totally deaf ear, it produces no sensation of sound at all.

ON FIBROMA OF THE LOBULE OF THE EAR.

By H. KNAPP.

DURING the last six years I have met with 7 or 8 cases of fibroma of the lobule of the ear. They all originated in the places in which the ears were pierced. They grew slowly after inflammatory irritation of this part. Chronic inflammation is frequently observed after the first introduction of a thread or metallic wire into the canal of the wound. As a rule, it disappears, and the ear is only disfigured by the foreign appendage. In other cases, the inflammatory swelling disappears, but the aim of the operation, the establishment of a canal, is not attained. Jewellers, however, come to the assistance of these unfortunate people, by selling them ingenious clasps by which these elegant ornaments can be fastened to the ear, that is, until the spring relaxes, and the jewel falls to the ground. In other cases, again—and these are comparatively numerous—the lobe of the ear is gradually divided while inflammatory symptoms are either present or absent. Tumors are so seldom met with after the ears have been pierced, that some authors, for instance, *Lawrence Turnbull*, are not inclined to take them as a consequence of the injury alone, but let a peculiar condition of the system, especially scrofulosis, or a galvanic action of the alloyed metals of the ear-ring, play a part in their production. I think that these tumors exemplify in a typical manner the fact that chronic inflammation, by organization of the exudation, lead to the formation of tumors, especially of connective-tissue tumors. Another well-known example of the same fact is the development of chalazia and larger fibrous tumors in the eyelids. In the lobe of the ear the perforation causes a slight inflammation, which in the majority of cases is followed by no unpleasant consequences; in rare cases, however, the wearing of a foreign body in the canal of the wound keeps up an irritation that leads to the organization of the exuda-

tion. This theory is the more probable since the lobule of the ear has but a very slight tendency towards the spontaneous development of tumors.

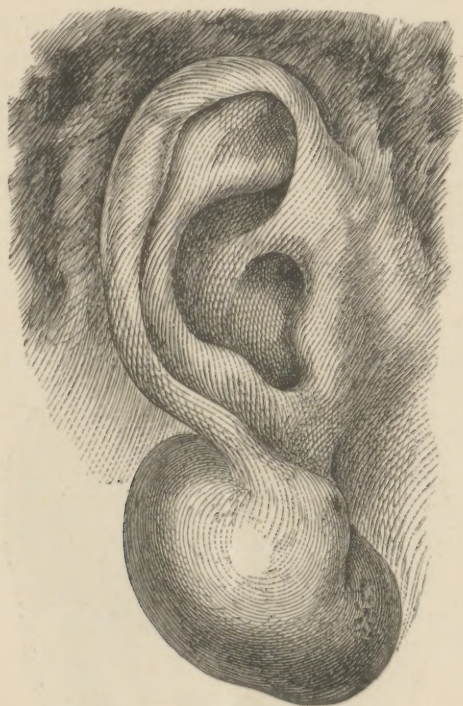


FIG. 1.

Authors state that the fibroma of the lobule occurs more frequently in the colored woman than in the white, and think the reason of it is that the poor negresses have to use earrings of commoner and heavier metal than their more fortunate white rivals.

The *diagnosis* of these tumors is easily ascertained. They present themselves as spheroidal dense swellings, the surface of which is smooth, here and there depressed, and covered with healthy skin, which is only in part movable over the tumor. The majority of them seem to project more on the posterior surface than on the anterior. The only tumor for which they may

be mistaken, is the atheroma, which, however, has a perfectly regular surface, and feels doughy or fluctuating when examined with the fingers.

The *development* of the fibroma of the lobule is slow, painless, and not accompanied by any irritation. The disfigurement and the inability to wear earrings, which these tumors cause, induce patients to seek medical help. These tumors seldom exceed the size of a filbert; in the negress, however, they sometimes grow to much larger proportions. A tumor of so extraordinary a size—that of a hen's egg—came to my notice, and induced me to write the present short communication.

The case was the following :

Mary Sh., a negress of 22 years of age, consulted me at the beginning

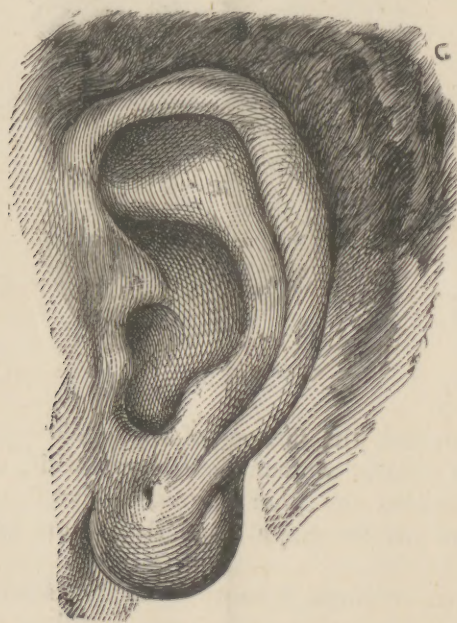


FIG. 2.

of November, 1874. The lobule of her right ear was the seat of a tumor, the size of a small hen's egg (see figure 1), which was ovoidal, had shallow depressions on its surface, and the skin which covered it could not be

moved without difficulty. Its consistence was that of a tough fibrous tumor. The growth was in such a way connected with the lobule that the shape of the lobule was still recognizable on its anterior surface, whereas its posterior surface was lost in the tumor. The junction of the cartilaginous part of the auricle, and the fibrous part of the lobule, was the upper limit of the growth. An indrawn cicatrix on the anterior surface of the lobule indicated the place where the ear had been pierced.

A similar growth, which had only the size of a hazelnut (see figure 2), was on the lobule of the other ear. It likewise projected more on the posterior surface than on the anterior; but a roundish swelling around the cicatrix of the perforation on the front surface showed that the growth had not sprung from the posterior part of the lobule alone, but from the whole extent of the canal.

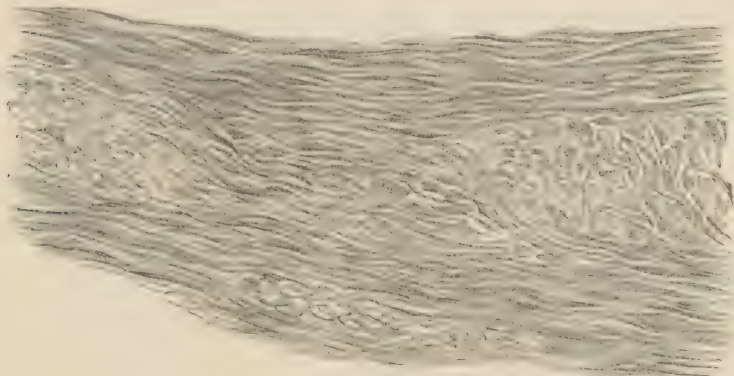


FIG. 3.

Both ears were otherwise well formed, and had never suffered from eczema or otorrhea. Two years before the operation the patient had her ears pierced, and wore heavy, common earrings about one year. The lobes became gradually thicker, and obliged her to remove the earrings, but the tumors continued steadily increasing.

I removed the larger tumor by dissecting from it an anterior and a posterior flap, and then separating it from its connection with the auricle above, and the skin of the lobule in front. The flaps were so shaped that after their union they reestablished the lobe of the ear in a manner quite satisfactory. I united them with ordinary sutures, and to render the scar less conspicuous I had formed the anterior flap so much larger, as was necessary to double its edge and apply the sutures at the posterior

surface of the newly-formed lobule. The lobule had the shape of the natural lobule, but its centre was somewhat thickened.

The operation on the other ear was simple. I made an incision from the lower end of the helix downward through the skin which covered the tumor, corresponding to the edge of the lobule. I then dissected the skin from both sides of the tumor, and removed the tumor by separating it from its further connections. Slight modelling of the flaps, and uniting them by ordinary sutures, was sufficient to restore a well-shaped lobule. In both cases the wounds healed by first intention.

Four months after the operation I saw the patient again, and found her left lobule slightly thickened in the centre, but her right was swollen to form a roundish, dense tumor the size of a cherry. A relapse of the growth, requiring another operation, had manifestly taken place.

The section surface of both tumors showed a dense trabecular framework with darker, more homogeneous interspaces. (See figure 3.) A canal, which was filled with debris of tissue, indicated in both tumors the places through which the earrings had passed. Fibrous trabecles radiated from this canal in different directions. They consisted of tough connective tissue, the fibrillæ of which lay close together, admitting only a few cells between them. The softer and semi-transparent interspaces between the trabecles contained a larger quantity of roundish, spindle-shaped, and stellate cells, which anastomosed with one another, and were separated by an abundant homogeneous or finely-striated intercellular substance. Mucoid and chondroid tissues were not found in the specimens. Both growths, as it is evident, were pure fibromata originated in the ground tissue of the lobule, which is fibrous in contra-distinction with the cartilaginous ground tissue of the auricle.

I have already mentioned that I consider these tumors as the result of the irritation which is kept up by the presence of a foreign body in the wound.

BILLROTH * states "that these tumors consist chiefly of fusiform cells and connective tissue, and are nothing more than hypertrophy of a cicatrix, such as occurs in other parts of the body after injuries." No objection can be raised to this view, if we

* General Surgical Pathology and Therapeutics. Translated by C. E. Hackley, p. 551.

have to deal with tumors that developed from the ends of the perforation on the outside of the lobule. They form round or oval nodes upon one or both surfaces of the lobule, leaving the lobule itself unchanged, as SIR WILLIAM WILDE* has described and illustrated. If, however, these tumors do not develop on the surface, but in the substance of the lobule, which they replace more or less completely, as in the case described above, their pathogenesis is best accounted for by a hyperplasia of the fibrous tissue of the lobule, which resulted from the irritation kept up by the foreign body, and developed into a smaller or larger fibroma.

Some authors state that fibromata of the lobule of the ear are apt to recur after their removal. The case described above is the only example, in my own experience, that confirms this statement. Relapses, if they occur in these benign tumors, are doubtless occasioned only by an incomplete extirpation of the original tumor. To secure a complete removal, the methods of operation have to be varied according to the differences of quality, seat, and size these tumors exhibit. Small tumors, and such as develop mainly on the ends of the orifices of the previous canal, but pass through the lobe, should be dissected out, and the roundish or elliptical opening closed with sutures, as WILDE did in his case. "It healed kindly, and the disease did not return." ROOSA† states: "The removal is readily effected by a V-shaped incision made with strong scissors. The edges of the wound are brought together by sutures." This method, the only one mentioned in this text-book, is not unobjectionable. In small tumors it involves a loss of tissue, and consequently a reduction in the size of the lobule, which is greater than in the method followed by Wilde; furthermore, the lobule easily loses its regular outline, and is notched, unless special precautions are taken. (See these Archives, vol. iii., No. 1, p. 254.) In large tumors both these methods would result in either incomplete removal or the sacrifice of the lobe of the ear. The restoration of the lobule requires a method similar to the one described in the above case, viz.: the formation of flaps taken from the skin covering the tumor. These flaps, however, should be so thin that no tissue of the tumor adheres to them, lest the growth return. It may not be quite easy

* Aural Surgery, chap. iv.

† Diseases of the Ear, 1873, p. 107.

to enucleate the growth radically, since even in the natural state the skin is so densely connected with the underlying fibrous tissue of the lobule that we cannot raise it with the fingers. Yet I think it possible, with a knife, cleanly to dissect two flaps of skin from a large tumor, and to restore a well-shaped lobule in which the disease does not return. In the case described above I preserved a thin layer of the tumor lining the anterior flap. Being a mere hyperplasia of the normal fibrous tissue of the lobule, it might, I thought, serve as a support to the new lobule. The foreign body, the cause of the hyperplasia, not being present any longer, I imagined there might be no relapse of the tumor. This view was erroneous, as I might have expected. We all know that tumors, when once called into existence by any cause, are apt to continue growing after the cause has ceased to act, and when incompletely removed, the part left behind most frequently becomes the starting point of a new tumor. Failures teach caution, and to learn the causes of failure is the beginning of success. From this point of view the publication of the above case and the accompanying remarks may be judged with indulgence.





